Specification of product value as a key part of Canvas business model in the context of industry 4.0

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Abstract

The purpose of this article is to specify the business model Canvas and its modifications in the manufacturing industry 4.0. The paper provides a review of the literature to expand our knowledge of how Industry 4.0 affects business models. This article aims to specify and analyze the Canvas business model and its application in the new revolutionary era of the digital world in manufacturing 4.0. Also, we defined the hypothesis that "exist a relationship between market type such specific market segment) and given value to the customer". The findings deepen the understanding of how 4.0 affects the manufacturing industry, B.M., and the behavior of the current economic environment. A lot of research in the field of industry 4.0 using Canvas B.M., but very often, the view of the Czech business environment is neglected. Focusing on this area may lead to future research. This literary review focuses on the latest literature indexed in the Web of Science and Scopus. The focus is on the period of 2013-2020. The research methodology is based on a comparison of research by other authors with a focus on industry 4.0 in the Czech Republic and worldwide, on the role of business models in this sector, and their interconnection. The main results of this research point to the importance of Industry 4.0 and its implementation, as well as the need to adapt business models to the needs of this revolution.

Keywords: business models, Canvas business model, Lean Canvas key performance indicators, manufacturing industry, industry 4.0, Czech Republic digitization, Industry 4.0.

Introduction

The term Industry 4.0 is already well known in the business environment. Its foundations were presented in a document at the trade fair in Hannover in 2013. However, the first ideas about the emergence of a new industrial era appear in 2011, and currently, the transition of companies to this new era is one of the most critical aspects of the Czech business environment (Confederation of Industry of the Czech Republic, 2019).

The fourth industrial revolution is a label for innovation and transformation of production processes. The internet and digitization enable complete interconnection and automation of all production processes as well as related services. Industry 4.0 brings technological and social changes. Production productivity increases by up to 30% and up to 40% of people will have to change their skills, but it does not just change the focus. The process of product innovation is also undergoing fundamental changes (Technodat, 2018; Koren and Shpitalni, 2010; Nayak, Dürr and Rothermel, 2015).

Industry 4.0 as such unifies the physical, information, and data components not only of the production environment itself. It connects machines, storage and logistics systems, and other technological components into one unit. An entirely digitized automated system brings significant improvements to all business processes. At the heart of this concept is the so-called "Smart Factory". This is a critical element of the transition to a digitized and automated whole. It can autonomously manage and at the same time streamline the complete production process. The Czech concept of I4.0 is broader than the world concept. It is not just a Smart Factory, but also a digital environment into which the company is gradually transforming (Ibarra, Ganzarain and Igartua, 2018; Fettig et al., 2018; Ematinger, 2017). The Czech concept focuses more on the customer and a smart product or service (Confederation of Industry of the Czech Republic, 2019).

In the summer of 2019, a survey was conducted, which included 105 Czech companies. In this survey, the manufacturing industry was represented in 59%, where 50 large enterprises (more than 250 employees), 31 medium-sized enterprises (50-250 employees), and 24 small enterprises (less than 50 employees) answered questions about the readiness and implementation of industry 4.0. This survey showed that most companies have 5% of their budget allocated to activities related to industry 4.0, and this survey also showed that large companies are more active in this regard. Companies in the Czech Republic are aware of the benefits that digitization, communication between systems and devices, and the flow of data to the company in real-time bring them. "Two-thirds of respondents said they had invested in elements of Industry 4.0 because it is important for their future. It is quite surprising that only 8.6% of companies feel external pressure to implement Industry 4.0 applications, whether from parent companies or customers.", comments Jiří Holoubek, a member of the board of the Confederation of Industry. It is generally stated that it is large companies, especially from the automotive industry, that should push their suppliers into the digital transformation. "However, only 36 percent of companies have developed a digital strategy, and in most of the implemented projects, it is probably more of a non-systematic implementation of isolated partial solutions. It continues to be confirmed that small and medium-sized enterprises, in particular, need more support in understanding the benefits of digital technologies and their subsequent deployment. Most often, companies invest in elements of Industry 4.0 to increase productivity per employee (56.2%), reduce unit costs (43.8%) and optimize the use of production capacity (41%). For large companies, the motive for reducing costs prevails. Small and medium-sized companies are mainly trying to increase productivity by investing in digital transformation. The experience of companies so far shows that most of their expectations associated with these investments have been entirely, or at least partially met. Half of the companies want to increase investment in this area in the next five years (Confederation of Industry of the Czech Republic, 2019).

The Canvas model, therefore, appears to be one of the most suitable business models for modification to the needs of Industry 4.0. This statement will be confirmed when mapping the area of knowledge of this topic.

This article is focused on the level of knowledge of the fourth industrial revolution and the related knowledge about business models, their modifications and uses in I4.0, and on finding a gap in this area. The outputs of this article will be used as literature research for a junior project, which will focus on identifying key performance indicators (KPI) according to their specification and relevance in individual areas of the Canvas model for the needs of manufacturing in the Czech Republic, where industry 4.0 is already evident.

Measuring performance helps to sort day-to-day activities in the companies.to reach strategic objectives. But, there is important to divide used metrics correctly. Industrial companies have different needs what and how to measure performance and effectiveness and display the results in financial units. The metrics' group of non-financial displaying should be included in a group of Key performance indicators (KPI), which are used in the most crucial fields in present and future development of the company. Therefore, KPI represents a tool, by which is possible to measure performance, find relevant results, and interpret them correctly (Zaherawati et al., 2011; Kerzner, 2011; Janíčková and Žižlavský, 2020). All used KPI metrics are depended on industry, corporate strategy, and present situation. Production companies could create fields according to their interests (e.g. costs, motivation, quality, or logistics). Individual groups have to be flexible and changeable due to the needs (Samsonowa, Buxmann and Gerteis, 2009). There is a general recommendation to keep rule 10/80/10 in each organization. This rule means that the company should use ten metrics in KRI, eighty metrics in PI and RI, and ten metrics in KPI (Parmenter, 2010).

Osterwalder, Pigneur and Clark (2012, p. 14) define a business model as the basic principle by which a company creates, transmits, and receives a value. Canvas The Canvas business model helps create value for the company. The business model can be described with the help of nine building blocks, which bring closer the logic of how a company wants to make money and create value. These elements provide four main areas in the company, which are: (1) customers, (2) supply, (3) infrastructure, and (4) financial viability. The business model can be understood as a strategic plan to be fulfilled through the organizational structure, processes, and systems. The building elements include:

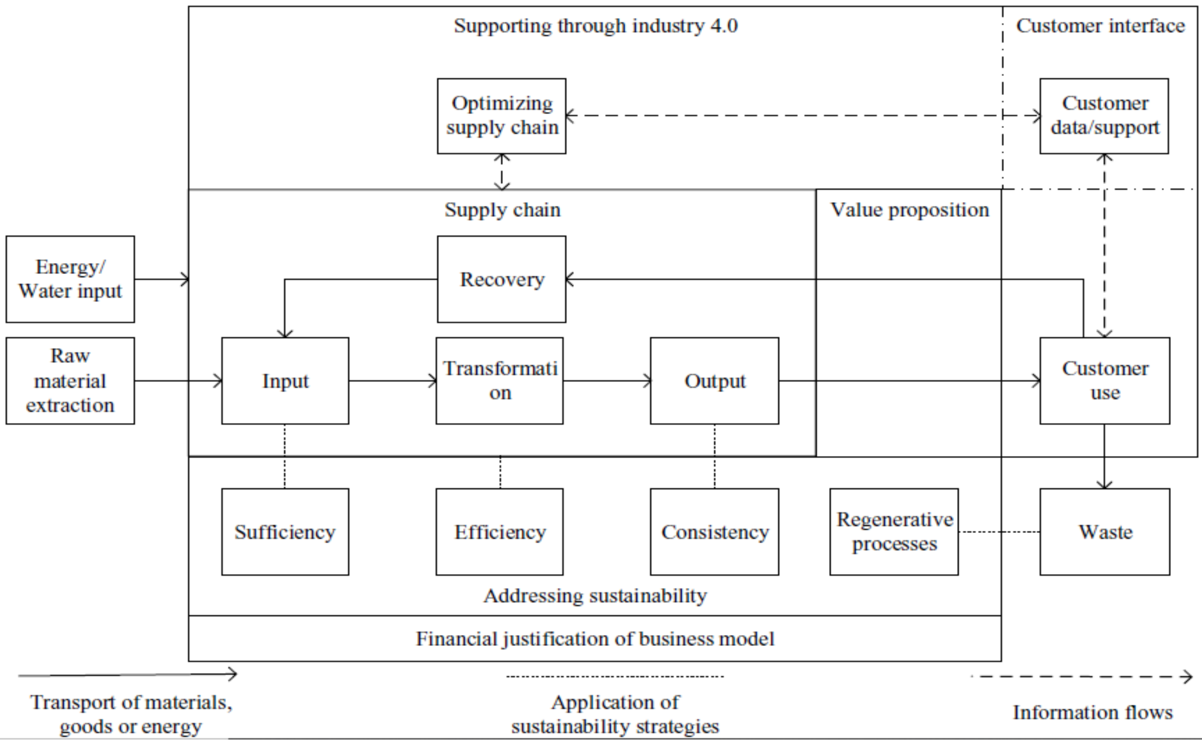
1. **Customer segments:** Customer segments define the groups of people or entities that a company wants to focus on. Customers are at the heart of any business model, without which a business would not be able to function for long because they make a profit for the business. A company can improve customer service by dividing it into segments according to needs and behavior. The business model can then define one or more large or small segments. Furthermore, a clear decision must be made on which segments to focus their efforts on.
2. **Value offers:** Value offers describe the combination of products and services that create value for a specific customer segment. The value offer is the reason why customers prefer one company over another. The offer deals with the customer's problem or satisfies his needs. Each value offer contains a combination of products or services that respond to the requirements of the segment. The value offer is therefore a set of benefits that the company offers.
3. **Channels:** Channels determine how a company communicates with its customer segments and how it has access to pass on a value offer. Communication, distribution, and sales channels form the boundary between the company and customers. Distribution channels are important points that play a significant role in customer satisfaction.
4. **Customer relations:** Customer relationships describe the types of individual relationships that a company builds within individual segments. The company should have an idea of the relationship it wants to build with each segment. Relationships can vary, from personal to automated.
5. **Sources of income:** Sources of income represent all income that the company generates within customer segments. If customers are at the heart of the business model, revenue represents its artery. The company should ask itself the question: What value is each segment willing to pay for? A successful response allows you to generate one or more sources of revenue from each segment.
6. **Key resources:** Key resources describe the key assets needed to operate a business model. These resources allow you to shape and present value offerings, reach markets, maintain customer relationships and generate revenue. Depending on the business model, different resources are needed. Key resources take on physical, financial, mental, or human forms.
7. **Key activities:** Key activities characterize the most important assets performed by the company, which are necessary for the functioning of its business model. Like the key resources, the key activities are needed to create and present value offerings, gain a foothold in the markets, maintain good relationships with our customers, and, last but not least, generate revenue.
8. **Key partnerships:** Key partnerships refer to the network of suppliers and partners necessary for the business model to work. Companies establish these partnerships for several reasons and become the cornerstone of many business

models. Partnerships are born, for example, to optimize a model, reduce risk, or obtain resources.

9. **Cost structure:** The cost structure represents all costs related to the business model. Creating and submitting a value offer, maintaining relationships with customers, and generating revenue generate costs. The costs are relatively easy to quantify only after identifying key resources, activities, and partnerships.

The role of business models in Industry 4.0 is significant. Every company has a business model and uses it to manage its processes. Therefore, when introducing Industry 4.0, it is first necessary to modify the business model to meet the requirements of the Fourth Industrial Revolution. Many studies from around the world confirm this step and its importance. Man and Strandhagen (2017) explore how to use business models in Industry 4.0 successfully. The authors created a scheme that connects sustainability and industry 4.0 to the business model (Man and Strandhagen, 2017). This diagram shows figure 1.

Figure 1: Connecting sustainability and industry 4.0 to the business model.



Source: Man and Strandhagen (2017).

The term Industry 4.0 is understood by the European Union (specifically by the European Parliament) as a term for a group of rapid transformations in the design, production, operation, and use of systems. Marking 4.0 means that this is the 4th industrial revolution for the world (European Union, 2015). In general, the Industry 4.0 concept can be characterized as a transformation of production as separate automated factories into fully automated and optimized manufacturing environments. Production processes are linked vertically and horizontally within enterprise systems. Sensors, machines, and IT systems are interconnected within the value chain across enterprise boundaries. For this purpose, the Cyber-Physical System (CPS) is the cornerstone for smart factories (Kopp and Basl, 2017).

Against these latest research results, we can oppose, for example, the study by Basl (2017), where the author focused on the readiness of Czech companies for Industry 4.0. This research was conducted by a questionnaire survey in which participated 161 Czech companies. The results show that Czech companies have a relatively high awareness of the existence of a trend known as Industry 4.0. This readiness manifests itself the most at upper-level management rather than on the average employee level. Companies still lack their own Industry 4.0 strategy, and they do not have assigned responsible persons who would take care of further deepening of principles of Industry 4.0. Higher penetration of the principles of Industry 4.0 into companies is so far inhibited by unclear benefits and in many cases, the high costs associated with the application of Industry 4.0 solutions. Industry 4.0 also belongs among the topics that are being strategically initiated and supported by top management in his visions, motivated by the customer demands, and is expected to bring lower costs. Finally, the investigation has shown that there is a large space for improvement in terms of delivery of available information on Industry 4.0 to the employees. Most companies (56%) stated that their employees are not yet aware of what this new trend means. Only about 8% of companies reported that Industry 4.0 is already part of the motivation of their employees (Basl, 2017).

Methods and Data

The purpose of the research as a base for this paper is to find out the literary overview, then the comparison of the author's views on the use of the business model, innovation, and adaptation under the influence of digitization. According to the purpose, there is a defined hypothesis, that "exists a relationship between market type such specific market segment) and given value to the customer". There were realized two research parts, secondary research, and primary research. The secondary research was focused on the analysis of scientific databases such as EBSCO, Science Direct, or Web of Science. Also, there was processed primary research with a focus on business activities in connection to the Canvas business model. In primary research participated 422 companies, which operate in various industries in the Czech Republic. On the defined hypothesis, there was applied Pearson χ^2 test for independence, which provides a potential relationship between individual variables. These variables as input are defined by (1) types of market and (2) variables with relevant value for the target segments. We processed the data by application of statistical software IBM SPSS Statistics 25.

Results

According to the defined purpose and stated hypothesis, there were used two groups of variables. These groups are closely connected to the individual parts of Canvas. The possibility to deliver required values is usually linked to the market, but under the condition of industry 4.0 elements, they should be modified. Therefore, we focused on observing the connection between all of these variables mentioned above:

- types of markets
    - specialized
    - segmented
    - mass
    - diversified
    - multilateral
- relevant value for the target segments
    - newness (different points of views)
    - output (improvement of creating products and services)
    - adaptation (product and service adaptation to specific needs)
    - task solution (creating solution)
    - design (part of the offered value)
    - brand (part of the offered value)
    - price (part of the offered value)
    - cost minimization (help to the customer within cost minimization)
    - risk minimization (help to the customer within risk minimization)
    - availability (assurance of availability of products and services)
    - convenience (convenience or easiness of usage)

Due application of chosen method (Pearson χ^2 test for independence) we defined 55 possible connections between individual variables (kinds of value and type of market). If the connection is put under verification and the value of significance must meet the 5% reliability level. If the value is lower than 0.05 as a response to the limit of 95% confidence level, then it is possible to declare, that in that relation exists statistical dependence. By contraries, if the value of significance is higher than 0.05, then the statistical dependence in the connection is not proved. From defined 55 relations, we found out only 14 relations with proved statistical dependence. Their results are shown in Table 1.

Because of the results in Table 1, we can say that there exist 14 statistical connections with statistical significance. The intensity of these connections could be explained by the due value of the contingency coefficient. The contingency coefficient refers to the power of the dependence, which belongs to interval $\langle 0; 1 \rangle$. If the value of the contingency coefficient is over 0.5 and close to 1, the dependence is strong. Vice versa, values under 0.5 are considered such medium or rather low. All gained values of contingency coefficient for gained relations are in interval $\langle 0.259; 0.381 \rangle$, which mean rather low intensity of dependencies between proved variables.

Tab. 1: Observed dependencies between individual variables and chosen type of market

		Specialized	Segmented	Mass	Multilateral
Output	*P*	46,076	No proven statistical significance	No proven statistical significance	No proven statistical significance
	S	0,009			
	C	0,319			
Adaptation	*P*	69,118	No proven statistical significance	59,959	33,397
	S	0,000		0,000	0,003
	C	0,381		0,359	0,276
Task solution	*P*	48,646	44,235	39,270	No proven statistical significance
	S	0,005	0,014	0,035	
	C	0,327	0,313	0,297	
Design	*P*	No proven statistical significance	42,465	No proven statistical significance	No proven statistical significance
	S		0,022		
	C		0,308		
Brand	*P*	40,417	No proven statistical significance	No proven statistical significance	No proven statistical significance
	S	0,035			
	C	0,301			
Risk minimization	*P*	44,400	No proven statistical significance	No proven statistical significance	29,129
	S	0,014			0,010
	C	0,314			0,259
Availability	*P*	56,618	43,658	No proven statistical significance	No proven statistical significance
	S	0,000	0,016		
	C	0,350	0,312		
Convenience	*P*	No proven statistical significance	40,665	No proven statistical significance	No proven statistical significance
	S		0,034		
	C		0,302		
P - Pearson chi-square; S – Significance; C - Contingency coefficient					

Source: own work of authors

Conclusion

Based on the literature research performed in this article, the level of knowledge in the monitored area was mapped in some detail. The results show that although the readiness of Czech companies for Industry 4.0 has significantly improved in recent years, there is still ample space for improvement. Businesses face significant obstacles to the introduction of new technologies and the overall unification of new knowledge with the traditional systems they have used so far.

This research will make it easier for many companies to implement Industry 4.0 and can deepen their scientific knowledge in this field. This connection will expand, simplify and improve the ability of companies operating in the manufacturing industry and at the same time in the Czech business environment to implement the concept of industry 4.0 This research will combine several methods that will provide many companies with this type of industry revolution.

Due to the breadth of the researched topic, there are many topics to discuss. Industry 4.0 concept has already penetrated some industries. As for the Czech Republic, the automotive and manufacturing industries are the best. Even there, however, companies are just beginning to work with the new concept, eliminating shortcomings and trying to meet the implementation of this system with as few obstacles as possible. Among other things, many other industries are not yet so far in implementing Industry 4.0 and need help with system modifications that will be tailored to their industry. All the knowledge that we know so far becomes with a certain degree of superficiality, and therefore it is important to focus research more in-depth on these topics and to expand knowledge in this area with greater detail.

The main limitation of this research is the overall diversity and significant differences in the levels of the manufacturing industry of the Czech Republic. Therefore, we first focused on the most advanced areas where Industry 4.0 is already implementing into companies. These businesses need our help immediately and indispensably to be able to connect their traditional methods, systems, and models with new technologies while still being able to measure their performance effectively.

Acknowledgment

The author would like to thank the Internal Grant Agency of University No.: FP-J-20-6445 Identification of key performance indicators in the Canvas business model in the Czech business environment for the manufacturing industry 4.0 for providing financial support.

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